

## **SESSION 3.3**

# **ITS CABINET SERIAL BUSES 1 & 2**

**DAVE MILLER**



# ITS CABINET SERIAL BUSES 1 & 2 (SB1, SB2)

## WHY SERIAL CABINETS ?

**General Purpose Instrumentation Rack for:**

<b>Traffic</b>	<b>Ramp</b>	<b>Camera</b>	<b>Surveillance</b>
<b>Irrigation</b>	<b>VMS /DMS</b>	<b>Lane Use</b>	<b>Rail/Highway</b>
<b>Speed</b>	<b>Incident</b>	<b>RWIS</b>	<b>HAR</b>
<b>Freeway Lane</b>	<b>ETC</b>	<b>AVI</b>	<b>HOV</b>
<b>Comm Hub</b>	<b>Violations</b>	<b>Weigh in Motion</b>	<b>Battery Backup</b>



## **SB1 & SB2 PHYSICAL LOCATION**

**Originates at 2070 ATC Controller**

**Chemically-bonded CAT5 twisted pairs**

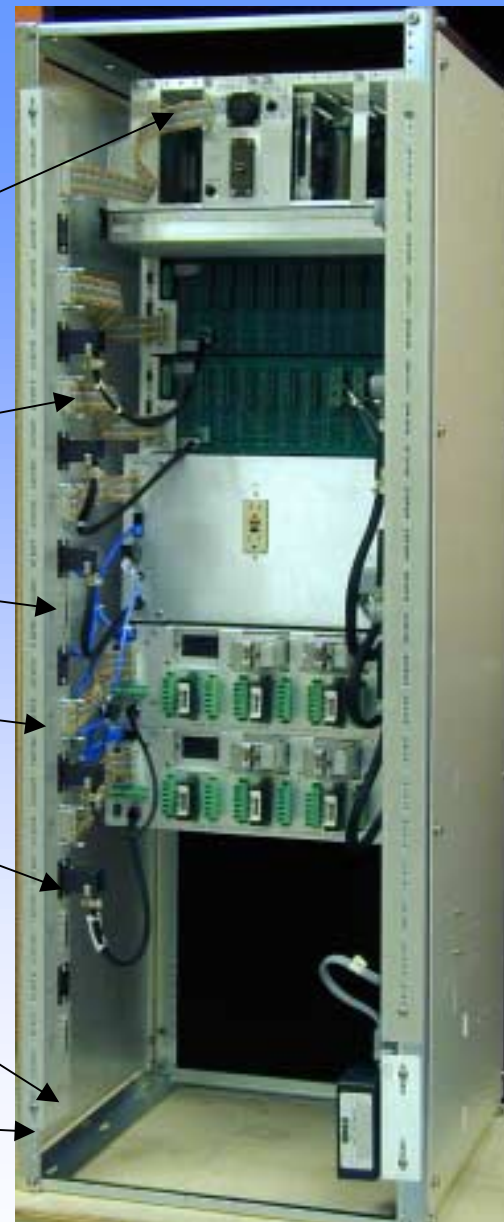
**25 pin “D” for each rack location**

**Removable metal communications bus**

**+24 VDC and +12 VDC power receptacles**

**Terminator block at end of SB1 & SB2**

**Connector for bus expansion below**



## **SB1 & SB2 ELECTRICAL CHARACTERISTICS**

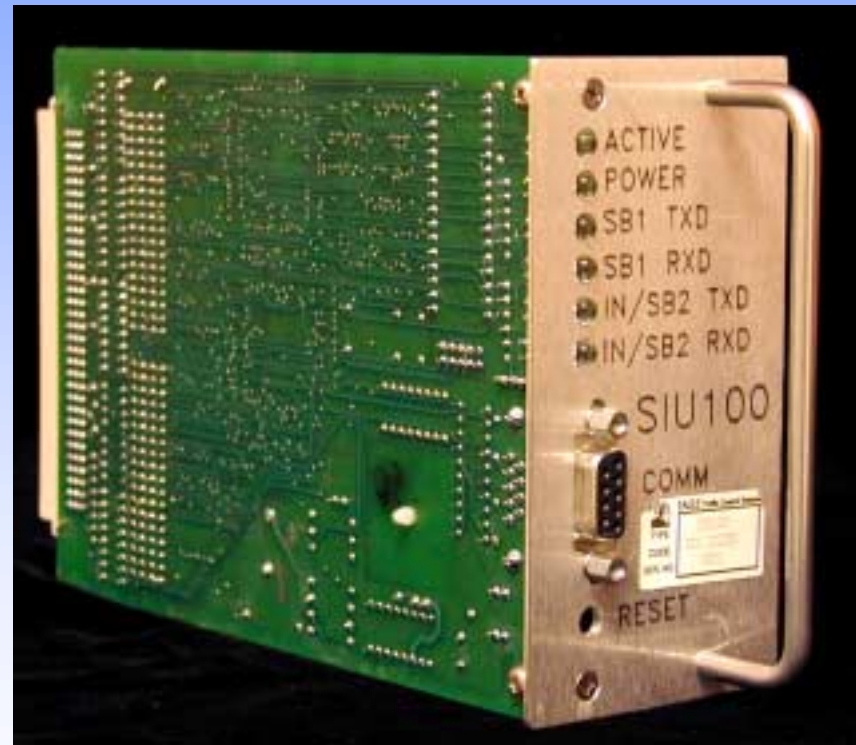
- **Category 5 (CAT5) twisted pair for TxD, RxD, TxC, RxC**
- **25-pin “D” receptacle for each rack position containing both SB1 and SB2 signals in single bundle**
- **EIA-485 balanced differential signals (DATA &  $\overline{\text{DATA}}$ )**
- **SB1 & SB2 originates at controller, ends at terminator block**
- **EIA-485 distances of thousands of feet with proper cable**
- **Controller can access I/O in cabinet at remote location**

## **SERIAL BUS 1**

- **“Real-time” communications from Controller to I/O**
- **614 KBPS communications speed, SDLC frames**
- **Command / response protocol with CRC and timeouts**
- **Controller “talks” to all devices in cabinet at once**
- **Peripheral device “listens” for its address and responds**
- **Normally used with Serial Interface Units (SIU)**
- **Same protocol as Field I/O, but at different addresses**



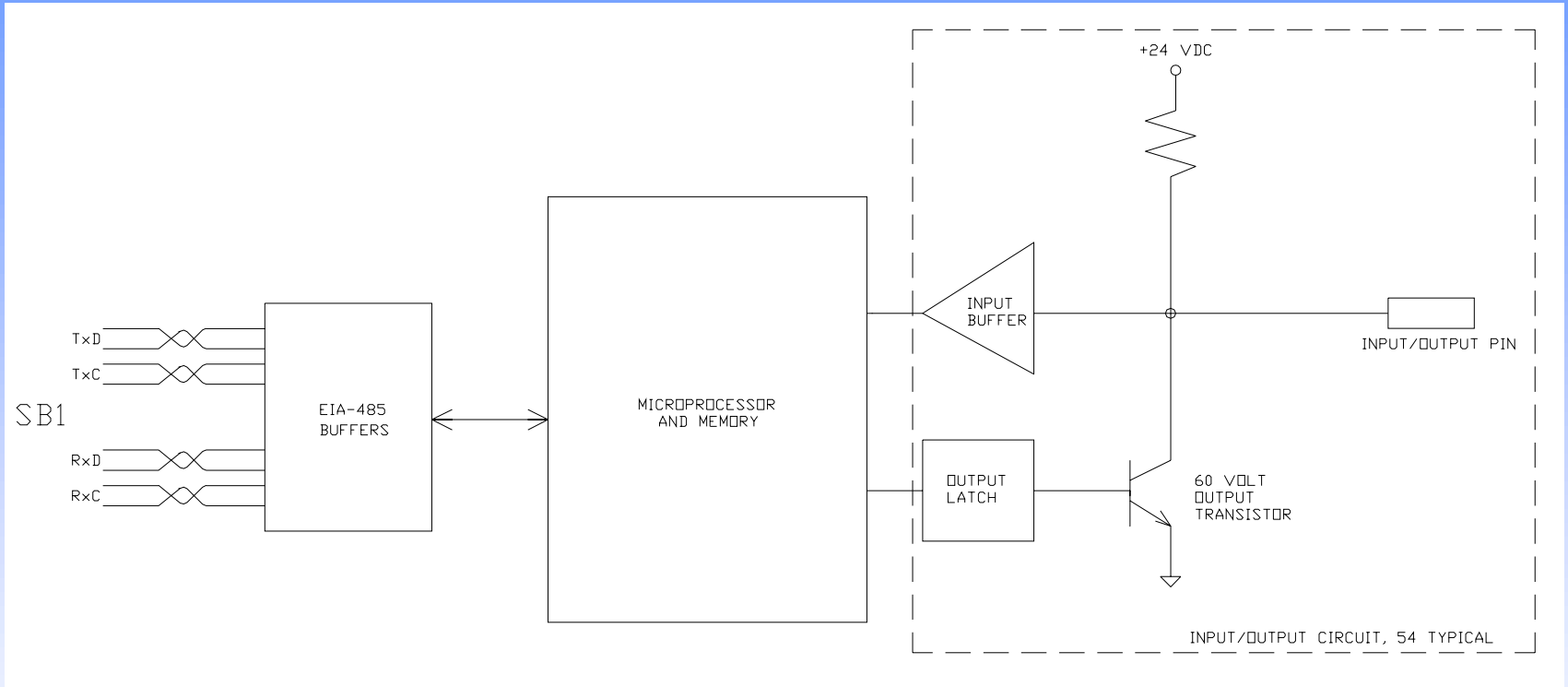
## SERIAL INTERFACE UNIT (SIU)



## **SERIAL INTERFACE UNIT (SIU)**

- **SB1 serial to parallel converter with safety features**
- **54 Input/Outputs in each SIU, ground true 24 VDC logic**
- **Each SIU responds to a unique rack address block**
- **SIU has microprocessor for input filtering and output mode**
- **SIU handles 54 detector calls / status or 14 load switches**
- **1 mS input resolution for accurate time stamps**
- **6 indicator lamps and reset switch for “hot-swap”**

# SIU BLOCK DIAGRAM



- Each pin functions as both input and output (1 of 54 shown)

## **SIU FUNCTIONAL DESCRIPTION**

- All output latches are cleared at power-up
- All output transistors are OFF at power-up
- With output OFF, pin functions as ground true input
- With output ON, pin functions as ground true output, with output state read back on the input buffer
- Output to input “wrap-around” test without cable
- “Mix and match” 54 pins individually as either IN or OUT
- 54 input addresses + 54 output addresses, no map needed



## **SIU FUNCTIONAL DESCRIPTION (cont'd)**

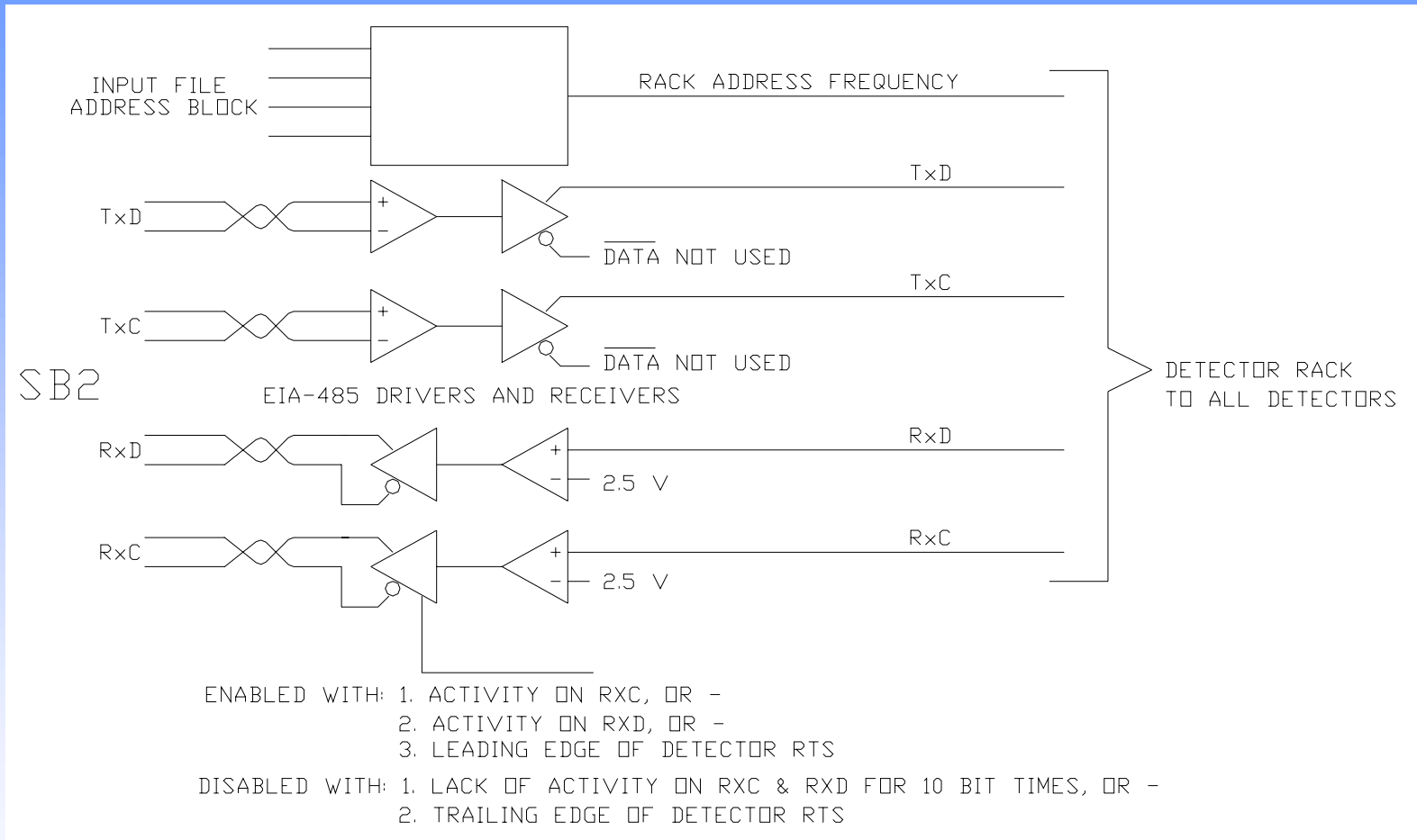
- **Inputs are “raw” or “filtered”, on command**
- **Several output modes, such as blinking, pulse**
- **Offloads processing work from controller to SIU**
- **2-second communications loss, outputs OFF**
- **Monitor checks for “lack of output” versus WDT**
- **9-pin EIA-232 connector for future use (reports, firmware)**
- **Activity lamp under control of user software**

## **SERIAL BUS 2**

- **SB2 located in same cabinet 25-pin “D” connector, CAT5**
- **Separate communications channel directly from controller to serial detectors for loop tuning, status, etc.**
- **Used for long “conversational” messages without impacting I/O update performance**
- **Protocol differs with each vendor and hardware device**
- **Software driver comes with each hardware device and is installed on 2070 ATC, similar to PC device drivers**
- **Anticipates future serial detectors other ITS applications**



# SERIAL BUS 2 BLOCK DIAGRAM



- SIU simply provides buffer between cabinet and detectors

## **SERIAL BUS 2 OPERATION**

- **SB2 is not connected to SIU processor. SIU simply buffers the balanced differential pairs of cabinet SB2 to single-ended driver to detectors.**
- **Controller opens synchronous port if detector is SDLC, or asynchronous if detector is UART with START / STOP bits**
- **Direct connection from applications code to input devices**
- **Compatible with existing serial detectors**
- **Controller “talks” to all detectors at once. Each detector knows what input file and slot it resides in**
- **Only the detector that matches the address frame of the message received from the controller answers back.**

